Prevalence of common gastrointestinal nematode parasites in scavenging pigs of different ages and sexes in eastern centre province, Burkina Faso

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ABSTRACT


The range and infestation intensities of gastrointestinal parasitic nematode species depend on the type of swine production system. The present study focused mainly on nematodes of veterinary importance in scavenging pigs in Burkina Faso, and aimed at determining the prevalence of gastro-intestinal nematode parasites by means of faecal egg per gram (EPG) counts. Between November 2001 and October 2002, faecal samples from 383 pigs of different sexes and ages (< 5 months, 5–12 months and > 12 months) were collected from the rectum and examined for gastrointestinal nematodes parasites using the Mc Master method. Of the 383 pigs examined, 91 % were infected by one or more parasites. Ascaris suum (40 %; 100–1400 EPG) was the most prevalent parasite followed by Strongyloides ransomi (21 %; 100–4200 EPG), Oesophagostomum spp. (18 %; 100–1000 EPG), Hysterangylus rubidus (11 %; 100–1800 EPG), Globocephalus spp. (10 %; 100–400 EPG) and Trichuris suis (1 %; 100–200 EPG). The prevalence was significantly higher in female pigs (n = 239) than in males. In addition, females excreted significantly (P < 0.05) more eggs in their faeces than males, except in the case of Globocephalus spp. The age of the animal had no effect on the prevalence of A. suum whereas there were significant differences in age categories concerning S. ransomi, H. rubidus, Oesophagostomum spp. and Globocephalus spp. Unexpectedly, the high prevalence of these common parasites was not accompanied by elevated EPG values, which suggests the existence of moderate infestations. The present work indicates that the common nematode infestations in pigs do not necessarily need a systematic herd anthelmintic treatment, as only a small number of worms is required to induce immunity.

A further study is needed to formulate appropriate and cost-effective strategies for the control of gastro-intestinal nematode parasites in pigs in Burkina Faso.

Keywords: Ascaris suum, Burkina Faso, Globocephalus spp., Hysterangylus rubidus, Oesophagostomum spp., pigs, prevalence, Strongyloides ransomi, Trichuris suis

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INTRODUCTION
Among the parasitic helminths, nematodes are considered as the most important worldwide. Most of them are unable to multiply inside the host and consequently they must leave it before the next generation can reach sexual maturity. Eggs and larvae are passed out of the body usually in large numbers. It follows, therefore, that each adult parasite must enter the host while still young, either as a contamination of pasture, food or water (Soulsby 1982).

Taking the above characteristics of the life cycle of nematode parasites into consideration, it is obvious that scavenging animals are more exposed to nematode infections. The occurrence of nematode parasites in scavenging pigs has been reported in several African countries such as Nigeria (Salifu, Manga & Ponytail 1990), Zaire (Chartier, Mutesi & Ndakala 1990), Zimbabwe (Borgsteede, Makinde & Hill 1991), Ghana (Permin, Yelifari, Bloch, Steenhard, Hansen & Nansen 1999), Cameroon (Tchoumboue, Tong & Awah-Ndukum 2000) and Tanzania (Esrony, Kambarage, Mtambo, Muhairwa & Kusiluka 1997; Ngowi, Kassuku, Maeda, Boa & Willingham 2004).

Nansen & Roepstorff (1999) reviewed the helminths in domesticated pigs. It appeared that *Ascaris suum*, *Oesophagostomum* spp., *Trichuris suis*, *Hyostrongylus rubidus*, *Strongyloides ransomi*, *Metastrongylus* spp. and *Stephanurus dentatus* were found to be the common helminths of veterinary importance in domesticated pigs.

Recently, in an abattoir survey on gastric infestations in scavenging pigs in Burkina Faso, Banga-Mboko, Tamboura, Maes, Traoré, Youssao, Sangild, El Amiri, Bayala, Remy & Beckers (2003) reported a prevalence rate of 16.4 % of *H. rubidus* infestation. The existence of *H. rubidus* as one of the common nematodes of veterinary importance prompted us to assess the complete spectrum of parasitic nematodes in scavenging pigs in Burkina Faso, as no such study has ever been carried out. The results of this study as well as a suggested control strategy are reported here.

MATERIAL AND METHODS

Study area

Burkina Faso is a landlocked country located in the heart of west Africa, and borders Mali to the north and west, Niger to the east and Benin, Togo, Ghana and Ivory Coast to the south (Fig. 1). The climate is Sahelian in the north and Sudanian in the south of the country (Kagone 2001).
in each resident quarter) recorded by the regional department of Bolgou, were included in the survey. Three hundred and eighty three pigs (144 males and 239 females) were recorded and were of native breeds. They were not penned during the day but were housed overnight. They were categorised as young (0–4 months), young adults (5–12 months), and older adults (more than 12 months). Their distribution according to sex and age is given in Table 1.

Sample collection

Faecal samples were taken from the rectum and transported to the laboratory in a cool box where they were stored at 4 °C until processed.

Faecal egg count

Faecal egg counts were expressed as eggs per gram (EPG) using the Master Mc technique as simplified by Roepstorff & Jorsal (1989) and Kaufmann (1996).

Procedure

For each sample, 3 g of faeces were deported into the first container and suspended in 42 ml of tap water. The mixture was then stirred thoroughly with a wooden spatula and passed through a 250 μm-aperture sieve, the filtrate was collected in a second container. The filtrate was then centrifuged at 100 g for 5 min and the liquid phase was discarded. The sediment was resuspended in a saturated salt solution (400 g NaCl and 1000 ml tap water) and stirred thoroughly again. The suspension was filtered again through a 250-μm aperture sieve. Then, the filtrate was poured into a third container and the two chambers of a Master Mc chamber slides were filled with a Pasteur pipette. Microscopic examination was car-
ried out at 10 x 10 magnification. The parasites were identified according to the keys listed by Thienpont, Rochette & Vanparijs (1995) and Kaufmann (1996). Results were expressed as eggs per gram (EPG).

In order to distinguish eggs of *Oesophagostomum* spp. from those of *H. rubidus* a faecal sample was incubated and the L3 larvae were collected using the Baermann method as described by Thienpont et al. (1995) and Kaufmann (1996).

**Statistical analysis**

The prevalence was calculated as the ratio between the number of animals having the parasites and the number of surveyed pigs. The egg numbers were analysed according to the General Linear Model procedure (PROC GLM) of SAS (1989) using gender (male and female) and age (young, young adult and older adults) as factors of variation. The means were estimated and compared by the student t-test. Two means were statistically different when the P-value was < 0.05.

**RESULTS**

**Parasitological examinations**

Of the 383 pigs examined, 92.7% (*n* = 355) was found to be infected with one or more nematode species. The results are presented in Fig. 2. In addition to the 383 surveyed pigs, 443 observation occurrences of parasites were recorded as showed in Table 2. Six nematode species, of which five of veterinary importance, were identified: *A. suum* (*n* = 179) followed by *S. ransomi* (*n* = 91) *Oesophagostomum* spp. (*n* = 78), *H. rubidus* (*n* = 49) and *G. urosltus* (*n* = 43), *T. suis* (*n* = 3) (Table 2). The prevalence and the EPG (mean and range) are given in Table 2. Forty percent of parasitized pigs were infected with *A. suum*, either as a single infestation or in association with other parasite species. In addition, only 14 pigs (7.9%) had an EPG for *A. suum* ranging between 500 and 1400. The occurrence and the association of *A. suum* with other parasites are shown in Table 3.

**Effect of sex on the prevalence and egg counts**

The prevalence was significantly higher in female pigs (*n* = 239) than in males (*n* = 144) with regard to *Globocephalus* spp. (24% vs 19%), *Oesophagostomum* spp. (53% vs 25%), *A. suum* (33% vs 16%), *T. suis* (3% vs 0%) and to *S. ransomi* (45% vs 46%). Overall, females excreted significantly (*P* < 0.05) more eggs in their faeces than males, except for *Globocephalus* spp. The results are shown in Fig. 3.

**Effect of age on EPG**

As can be seen in Fig. 4, all pigs in the different age groups were infected with nematodes. Nevertheless, the adults young adults were more heavily infected with *S. ransomi* than were the young (*n* = 81) or the
older pigs (n = 138). In addition, old adult pigs were more infected with *Globocephalus* spp. and *Oesophagostomum* spp. than young and young adult pigs. The EPG values were similar in all groups with regard to *A. suum*, whereas there was a significant difference within age categories concerning *S. ransomi*, *H. rubidus* *Oesophagostomum* spp. and *Globocephalus* spp. Overall, the young and old adults excreted significantly more eggs than the younger pigs (P < 0.05).
Gastrointestinal nematode parasites in scavenging pigs in Burkina Faso

### TABLE 3
Occurrence and association of *Ascaris suum* with other nematode parasites in scavenging pigs (383) in the Eastern Centre Province, Burkina Faso

<table>
<thead>
<tr>
<th>Parasites</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A alone</td>
<td>97</td>
<td>54.00</td>
</tr>
<tr>
<td>A + H</td>
<td>12</td>
<td>7.00</td>
</tr>
<tr>
<td>A +G</td>
<td>11</td>
<td>6.00</td>
</tr>
<tr>
<td>A +O</td>
<td>35</td>
<td>20.00</td>
</tr>
<tr>
<td>A +S</td>
<td>4</td>
<td>2.00</td>
</tr>
<tr>
<td>A +G + H</td>
<td>1</td>
<td>1.00</td>
</tr>
<tr>
<td>A +G S</td>
<td>5</td>
<td>3.00</td>
</tr>
<tr>
<td>A +O +S</td>
<td>10</td>
<td>4.58</td>
</tr>
<tr>
<td>A + O + H</td>
<td>1</td>
<td>0.56</td>
</tr>
<tr>
<td>A +G +S + T</td>
<td>1</td>
<td>0.56</td>
</tr>
<tr>
<td>A + O +H + S</td>
<td>1</td>
<td>0.56</td>
</tr>
<tr>
<td>A + O + S + T</td>
<td>1</td>
<td>0.56</td>
</tr>
</tbody>
</table>

A = *Ascaris suum*
H = *Hyostrongylus rubidus*
G = *Globocephalus* spp.
O = *Oesophagostomum* spp.
S = *Strongyloides ransomi*
T = *Trichurus suis*

The prevalence rate was calculated on the basis of 179 pigs infected by *A. suum*, as below frequency x 100 / 179

**DISCUSSION**

Of the seven nematode species listed as helminths of veterinary importance (Nansen & Roepstorff 1999), five were found in scavenging pigs in the Tenkodogo town of Burkina Faso. Ninety-two percent of the pigs were infested with one or more nematode species. Similar results have been reported in other African countries over the past 15 years (Chartier et al. 1990; Salifu et al. 1990; Borgsteede et al. 1991; Esrony et al. 1997; Permin et al. 1999; Nsoso, Mosala, Ndebele & Ramabu 2000; Tchouboue et al. 2000; Kagira, Kanyari, Munyua & Waruiru 2002). Similar findings have been also reported in free range pigs in Belize (Gibbens, Gibbens & Fielding 1989), Denmark (Roepstorff & Jorsal 1989), Greece (Theodoropoulos, Deligeorgis, Fegeros, Papavasiliou, Helmis & Rogdakis 2002), India (Kumar, Prasad, Singh & Kumar 2002; Rajkhowa, Choudhury, Bujarbarruah, Mitali Dutta & Dutta 2003). The high prevalences in African countries may be explained by the lack of an effective control system which would, however, to put it into practice, require more information about the epidemiological pattern, the availability of the new anthelmintics and the better education of the farmers.

The fact that *A. suum* was the most prevalent nematode agrees with other studies carried out in scavenging pigs (Yadav & Tandon 1989; Salifu et al. 1990; Kumar et al. 2002; Rajkhowa et al. 2003; Ngowi et al. 2004), in semi-intensive systems (Nsoso et al. 2000) or in organic swine herds (Carstensen, Vaarst & Roepstorff 2002).

In 1989, Roepstorff & Jorsal investigated the association of *A. suum* with other parasite species in Ghana. Their findings are similar to ours and confirm the occurrence of polyparasitism in scavenging pigs.

The prevalence of *H. rubidus* was lower than that found in our previous study (Banga-Mboko et al. 2003). This can be explained by the fact that in the former study, post mortem worm counts were performed. Furthermore, it is known that *H. rubidus* has a low fecundity and consequently produces a relatively small number of eggs (Roepstorff & Nansen 1998).

Less than 20% of the pigs excreted eggs of *S. ransomi*. This prevalence rate did not differ much from that found by Gibbens et al. (1989), Esrony et al. (1997) and Permin et al. (1999) who described excretion rates of 2%, 9% and 1.5%, respectively. By contrast, high levels of infection were observed by Salifu et al. (1990) and Rajkhowa et al. (2003) who found rates of 87% and 74%, respectively.

*Globocephalus* spp. (8.5%) infection was a fairly rare infestation as previously reported by Gibbens et al. (1989), Yadav & Tandon (1989) and Permin et al. (1999) with 25%, 8% and 2.7%, respectively.

Interestingly, 15.6% of the pigs excreted *Oesophagostomum* spp. eggs. This prevalence is lower than the rate of 45% of Gibbens et al. (1989), 27.6% of Yadav & Tandon (1989), 40% of Esrony et al. (1997), 53% of Permin et al. (1999) and 27.6% of Kagira et al. (2002). This may be due to the lack of available vegetation and pasture during the large part of the year (Kraglund, Roepstorff & Gronvold 2001).

The coprological examinations revealed that only 0.6% of the samples contained *T. suis* eggs. This low prevalence agrees well with the results of earlier studies in Belize (Gibbens et al. 1989), Denmark (Roepstorff & Jorsal 1989) and Tanzania (Esrony et al. 1997) which indicate an extremely low infestation level. This supports the statement that despite the potential of long survival time for *T. suis*, its egg mortality is higher under field conditions (Nansen & Roepstorff 1999).

Esrony et al. (1997), and later Nsoso et al. (2000) and Kumar et al. (2002), observed the effect of sex and age of pigs on the prevalence of helminth para-
sites. Their findings agree with our data, indicating that nematode parasites have a wide occurrence spectrum.

Similar to the observations of Permin et al. (1999), the overall high prevalence of nematode infections was not associated with high EPG. For example, in A. suum infestation, the most common nematode, only 7.9% of pigs showed higher EPG. This is in contrast with the work of Nsoso et al. (2000) who found a mean EPG of 1 500 vs 300 in the present study. It is possible that during our survey one part of the ascaris population might have just started to reach potency but may have already caused disease (Thienpont et al. 1995; Kaufmann 1996). Secondly, the mean EPG in Oesophagostomum spp. infestations found in this study was 219 units whereas in the heavy infestations in pigs, it may range between 3 000 and 14 000 EPG (Nansen & Roepstorff 1999).

This may be due to the short rainy season in the Tenkodogo area coupled with a long dry season which results in low environmental humidity. Such an environment would not satisfy the optimum requirements needed for the development of nematode eggs. Another explanation is that scavenging pigs being exposed for a long time to nematode infestations might develop an immunity that in sows could also be transferred passively to their offspring (Kelly & Nayak 1965; Smith & Herbert 1976; Murrell 1981; Eriksen, Lind, Nansen, Roepstorff & Urban 1992). In addition, it is well known that one of the host's immunity reactions consists of the inhibition of the fecundity of female worms so that the number of eggs laid decreases in proportion to the increase of the host's resistance. In certain cases, the egg excretion can cease indefinitely (Thienpont et al. 1995).

The present work indicates that the common nematode infestations of pigs do not necessarily need a systematic herd anthelmintic treatment, but does suggest that some pigs should be dewormed at the end of the rainy season. The latter would prevent outbreaks of parasitic gastroenteritis during the long dry season and would reduce the carry-over of infestation into the next rainy season. Further investigations are required to formulate appropriate and cost-effective strategies to control gastro-intestinal nematode parasites of pigs in the Tenkodogo city.

CONCLUSIONS

Five of the seven common parasites of veterinary importance in pigs were found to infect pigs in Tenkodogo. A. suum was the most common parasite and infested both sexes and different age categories. The prevalence rates of other parasites were influenced by sex and age. The occurrence of this large spectrum of parasites raises the question as to whether there are zoonotic parasites in scavenging pigs in Burkina Faso such as tapeworm (Cysticercus cellulosae) or Trichinella spiralis. In a community setting where pigs are reared and pig meat is consumed by a large part of the population, they could be involved in zoonotic helminthosis and a further investigation should study the possible impact of parasitic infestations of pigs on public health in Burkina Faso.

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